Activity I: Satellites, Weather Charts, and a European Journey

Introduction

In this section, students learn how weather data is collected, presented in charts, and used to make decisions. **Activity I: Satellites, Weather Charts, and a European Journey**, provides internet resources that students use to understand the basic systems (satellites and charts) used in weather forecasting, and how these forecasts are used. In this section, students will become familiar with how weather is measured and depicted, using satellites, charts, and other images, then will use their knowledge to make decisions on a flight plan over Europe. **Part A - Understanding Satellites** addresses how satellites are used, the kinds of data they present, and the history of satellite use. Students finish this unit by providing a model of the orbits used by satellites and the frequency of satellites using those orbits. In **Part B - Understanding Weather Charts and Maps**, students learn how to use the symbols on weather charts and use this information to make decisions about a present flight across Europe.

Part A - Understanding Satellites

The English Meteorological Office has some wonderful, concise guides to reading maps and charts, and understanding satellites. Find these guides at
http://www.met-office.gov.uk/education/esleaflets/satellites.html
and
http://www.met-office.gov.uk/education/esleaflets/charts.html
and use the enclosed information to answer the following questions.

1. When was the first satellite launched?

2. What advantages do satellites provide meteorologists?

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3. What are the two types of satellites?

4. Why does the polar orbiting satellite see a new piece of the Earth every orbit?

5. Based on the resolution and type of images, what do you think each type of satellite's images would be useful for doing? Write the name of the satellite type next to each idea below.
   - Seeing the "big picture" about general cloud cover or clearness over continents and oceans
   - Evaluating small storms over a single country
   - Determining cloud structure
   - Determining relative size of the Earth's continents, oceans
   - Evaluating the components of the atmosphere
   - Observing sea ice (icebergs)

6. Explain how radiometers are used and what kind of information they can generate.

7. Which radiometers can and cannot be used at night, and why?

8. If both radiometers are used together, then we can better determine the type of weather situations in a region. Describe what the following images indicate. (visible light = vl, infrared radiation = ir)
   - both images show a white cloud
   - both images show a gray cloud
   - both images show a dark cloud
   - vl = white cloud, ir = dark cloud
   - vl = dark cloud, ir = white cloud
   - vl = scattered, dark cloud, ir = white marks on Earth

9. What are the two types of clouds? Draw a picture and explain what kinds of weather they are associated with.

10. Sketch a picture of the Earth. If the radius of the Earth is 6.38×10^6 m, determine your scale factor and from that, sketch the following altitudes (in meters) as circular orbits around your planet.

- 350,000
- 480,000
- 600,000
- 750,000
- 900,000
- 1,100,000
- 1,400,000
- 35,780,000

Now place circles on your diagram to represent different satellites. Write next to each the year of launch, nationality of the satellite (if known), and the satellite's purpose (if known).

11. See what some of these satellites see!
At http://www.sat.dundee.ac.uk/ satellite images are posted (some in real time) that show everything from current weather conditions, weather anomolies, and volcano eruptions, to beautifully captured cloud formations, storm fronts, and man-made clouds (as from planes). Several of the satellites from question #10 are featured.

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Part B - Understanding Weather Charts

use http://www.met-office.gov.uk/education/esleaflets/charts.html

1. What does high pressure look like on a weather chart? (Draw a picture.) What kinds of weather conditions does this bring in the winter and summer?

2. What does low pressure look like and what kinds of weather conditions are associated with it? Draw a picture and explain.

3. How do isobars represent strength of wind, pressure, and direction? Include a picture and a description.

4. What are the three most common fronts in the United Kingdom, and how are they depicted? Use the chart on page 9 to explain.

5. When wind is depicted, and an arrow is seen, which side of the arrow shows where the wind it blowing to and where it is blowing from? What do the feathers on the tail of the arrow represent? Draw an arrow and label it appropriately.

6. How is visibility depicted? Provide an example and explain what it means.

7. What are the following visibility measurements?

Station Mark	Visibility
• 5	
• 50	
• 17	
• 57	
• 80	
• 100	

8. How is cloud cover depicted? Use a chart to show the symbols and their meanings.

	Cloud Cover Symbol	Meaning of Symbol
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Name: Date:

Most Common Weather Fronts in the UK						
	Front Type	**Symbol for Front**	**Weather Occurring Ahead of Front**	**Weather Occurring Behind Front**	**Pressure Before Front**	**Pressure Behind Front**
1.	Warm front					
2.	Cold front					
3.	Occluded front				NOT SPECIFIED	NOT SPECIFIED

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9. What are the weather symbols used on United Kingdom maps? Use a chart to show symbols and their meanings.

	UK Weather Symbol	Meaning of Symbol
1.		
2.		
3.		
4.		
5.		
6.		
7.		

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10. Work in small groups on your own region that the teacher will assign to you. Prepare to present your information in a very short oral and graphic presentation.

a. Obtain a weather chart from this web site and sketch it or print it out.

b. Next to each weather station, write a summary of the weather conditions.

c. Create a weather summary for the region that you could provide to pilots. This will require you to be discriminating. Pilots will not need all pieces of information, but will require some. Make your communication as concise as possible. Prepare to present it orally and as a very simple weather map.

d. Present your summary.

e. Listen to other summaries and take notes.

f. Determine where you will fly your class airplane and which regions you will avoid. Also discuss precautions you will take and specific regions you will follow up on, to check on weather developments.

g. Follow up with this activity over several days so you can get a sense about how decision making is dynamic, based on weather systems.